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SOLUTIONS OF PROBLEMS.

ALGEBRA.

408. Proposed by EMMA M. GIBSON, Drury College, Mo.

Show that if n is a positive integer, the sum of the series

is

$$1 - \frac{2n-1}{1} + \frac{(2n-1)(2n-2)}{2} - \dots + (-1)^{n-1} \frac{(2n-1)(2n-2) \dots (n+1)}{n-1}$$

$$= \frac{(-1)^{n-1}(2n-2)(2n-3) \dots (n+1)n}{n-1}.$$

SOLUTION BY HOWARD C. FEEMSTER, York College, Neb.

Let

$$S_1 = 1, \quad S_2 = -\frac{2n-2}{1}, \quad S_3 = \frac{(2n-2)(2n-3)}{2},$$

$$S_4 = -\frac{(2n-2)(2n-3)(2n-4)}{3}.$$

Assume

$$S_r = \frac{(-1)^{r-1}(2n-2)(2n-3) \dots (2n-r)}{r-1},$$

then

$$S_{r+1} = \frac{(-1)^{r-1}(2n-2)(2n-3) \dots (2n-r)}{r-1}$$

$$+ \frac{(-1)^r(2n-1)(2n-2)(2n-3) \dots (2n-r)}{r}$$

$$= \frac{(-1)^r(2n-2)(2n-3)(2n-4) \dots (2n-r-1)}{r},$$

which is of the same form as S_r . Hence,

$$S_n = \frac{(-1)^{n-1}(2n-2)(2n-3)(2n-4) \dots [2n-(n-1)](2n-n)}{n-1}$$

$$= \frac{(-1)^{n-1}(2n-2)(2n-3)(2n-4) \dots (n+1)n}{n-1},$$

as required.

Note. This is simply half of the expansion, $(1-1)^{2n-1}$, the other half, S_n' , is equal to this but opposite in sign. $S_n + S_n' = 0$.

Also solved by HORACE OLSON, A. M. HARDING, and GEO. W. HARTWELL.

409. Proposed by C. E. GITHENS, Wheeling, W. Va.

Find integral values for the edges of a rectangular parallelepiped so that its diagonal shall be rational.